

# Pallet Industry Relying More On Recovered Wood Material

*Recycled Pallets, Parts, Now at 42% of Total Wood Used in Pallet Production*

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Table 1. Estimated volume of new solid wood use by the pallet and container

Wood Material	1992 (MMBF)	1993 (MMBF)	Percent Change (+/-)	1995 (MMBF)	Percent Change (+/-)	1999 (MMBF)	Percent Change (+/-)
Hardwood lumber/cants	3,957	3,852	-2.7	3,867	+<.1	3,704	-4.2
Hardwood parts	785	972	+2.4	661	-32.0	707	+7.0
Softwood lumber/cants	1,623	1,504	-7.3	1,533	+1.9	1,520	-<.1
Softwood parts	529	615	+16.3	254	-58.7	610	+140.2
<b>Total</b>	<b>6,894</b>	<b>6,943</b>	<b>+&lt;.1</b>	<b>6,315</b>	<b>-9.0</b>	<b>6,541</b>	<b>+3.6</b>

*(Editor's Note: The following article is a research report titled, Wood Use Trends in the Pallet and Container Industry: 1992 - 1999, that was published by the authors earlier this year. The research was conducted by Virginia Tech in collaboration with the U.S. Forest Service Southern Research Station. Part one, published in September, summarized the findings of the study and focused on a number of areas, including use of hardwood, softwood and wood panels, new pallet and skid production, pallet recovery and utilization, and other topics. In part two, which follows, the authors examine the results of the study in combination with previous studies in order to identify wood use trends.*

## Industry Trend Analysis

In order to identify wood use trends within the U.S. pallet and container industry, the results of this study were examined in combination with those of previous such studies conducted by Virginia Tech and the U. S. Forest Service. These earlier studies were conducted in 1992, 1993, and 1995. Since the studies

used similar methods to obtain their estimates, direct comparisons can be made between their results.

To improve the readability of this section, each year's study will be cited only once as follows: 1992 (Christoforo 1993); 1993 [new pallet and wood use] (Hansen et al. 1994); 1993 [pallet repair and recycling] (Hansen et al. 1994); 1995 [new pallet and wood use] (Reddy et al. 1997); and 1995 [pallet repair and recycling] (Bush et al. 1997).

## New Wood Material Use

The pallet and container industry's use of solid wood materials, that is, the consumption of hardwood and softwood lumber, cants, and parts, was estimated at 6.54 billion board feet for 1999. This represents a 3.6% increase over the 1995 estimate. Despite this modest increase, the industry's use of new solid wood materials remains less than in the early 1990s. Of the four studies conducted by Virginia Tech to track wood material use by the pallet and container industry, the 1993 study showed the greatest level of consumption of new solid wood materials at 6.94 billion board feet.

## Hardwood

A notable trend identified in the study was a slight decline in the use of hardwood lumber and cants (Table 1.) Study results revealed an estimated 4% decline in hardwood lumber and cant consumption and a 7% increase in hardwood parts consumption between 1995 and 1999. The pallet and container industry continues to purchase and utilize mixed hardwoods more than any other species or species group (Table 2). For 1995 and 1999, mixed hardwoods represented approximately 56% and 51% of the total hardwood consumption, respectively. Another notable trend is a decline in alder use. In 1993 the industry consumed an estimated 393 million board feet of alder, which was equivalent to 8% of the total hardwood use. It was estimated that 92 million board feet of alder was consumed in 1999, representing 2% of the hardwood utilized by the industry. David Sweitzer of the Western Hardwood Association credits an aggressive domestic and international alder marketing campaign for gradually increasing the price of alder over the last 25 to 35 years, resulting in alder as the third most exported hardwood species (Kaiser 1998).

## Softwood

Between 1995 and 1999, the industry's annual consumption of softwood parts increased from 254 million board feet to 610 million board feet. In 1999, approximately 33% of new solid wood materials used by the pallet and

Table 2. Estimated volume of solid hardwood species use by the pallet and container industry: 1992, 1993, 1995, and 1999

Hardwood Species	MMBF				Percentage of hardwood species used			
	1992	1993	1995	1999	1992	1993	1995	1999
Oak	1,879	1,511	1,221	1,350	39.6	31.3	27.0	30.6
Yellow-poplar	601	574	379	478	12.7	11.9	8.4	10.9
Basswood / Aspen								
Cottonwood	204	267	N/A*	N/A*	4.3	5.5	-	-
Alder	361	393	165	92	7.6	8.2	3.7	2.1
Mixed Hardwoods	1,584	1,998	2,547	2,256	33.4	41.4	56.2	51.1
Other Hardwoods	114	81	216	234	2.4	1.7	4.8	5.3
<b>Total</b>	<b>4,742</b>	<b>4,824</b>	<b>4,528</b>	<b>4,411</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding. \* Data not collected

Table 3. Estimated volume of solid softwood species use by the pallet and container industry: 1992, 1993, 1995, and 1999

Softwood Species	MMBF				Percentage of softwood species used			
	1992	1993	1995	1999	1992	1993	1995	1999
Southern pine	853	724	731	1,026	39.7	34.2	40.9	48.2
Douglas-fir	620	512	199	214	28.8	24.2	11.2	10.0
Hemlock-fir	N/A*	N/A*	178	233	-	-	10.0	10.9
Spruce-Pine-Fir	N/A*	N/A*	552	539	-	-	30.9	25.3
Other softwoods	679	883	126	117	31.6	41.7	7.1	5.5
<b>Total</b>	<b>2,152</b>	<b>2,119</b>	<b>1,786</b>	<b>2,130</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding. \* Data not collected

Table 4. Estimated number and proportion of pallets recovered by the pallet industry for each pallet type: 1992, 1993, 1995, and 1999

Type of Pallet Received	Number of pallets recovered (millions)				Proportion of pallets recovered by type (%)			
	1992	1993	1995	1999	1992	1993	1995	1999
Single-use/limited-use	9.4	14.9	29.7	34.9	14.3	17.9	17.4	11.7
Multiple-use grocery	40.3	52.2	107.3	196.2	61.3	62.7	62.7	65.6
Other multiple-use	15.2	13.1	26.8	51.4	23.2	15.7	15.6	17.2
Other pallet type/skids	.8	3.1	7.3	16.5	1.2	3.8	4.3	5.5
<b>Total</b>	<b>65.8</b>	<b>83.3</b>	<b>171.1</b>	<b>299.0</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding.

Table 5. Estimated wood volume and proportion of pallets recovered by the pallet industry for each pallet type: 1992, 1993, 1995, and 1999

Type of Pallet Received	Estimated board feet of pallet lumber recovered (MMBF)				Proportion of volume recovered by type (%)			
	1992	1993	1995	1999	1992	1993	1995	1999
Single-use/limited-use	95.3	146.5	301.4	338.5	9.3	11.9	11.6	7.6
Multiple-use grocery	637.2	804.4	1697.7	2973.2	62.1	65.1	65.2	66.6
Other multiple-use	281.9	237.7	496.1	910.9	27.5	19.2	19.0	20.4
Other pallet type/skids	12.3	47.0	109.9	238.5	1.2	3.8	4.2	5.3
<b>Total</b>	<b>1,026.7</b>	<b>1,235.7</b>	<b>2,605.1</b>	<b>4,461.1</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding.

container industry was softwood, up from the 31% reported in 1992 and 1993, and 28% for 1995. The use of Southern Pine (also called Southern Yellow Pine) and its percentage of the total softwood consumption have steadily increased since the 1993 study (Table 3). Southern Pine consumption increased from 724 million board feet and 34% of the softwood consumed in 1993 to just over 1 billion board feet and 48% of the softwood used in 1999. The use of douglas-fir continues to decline in the pallet and container industry. Its use decreased from 620 million board feet in 1992 to 214 million board feet in 1999.

## Wood Panels

Softwood plywood continues to be the most utilized wood panel product by the pallet and container industry despite its estimated 5% decline in use from 1995 to 1999. In comparison, oriented strand board use rose from 30 million to 77 million square feet over the same period of time, representing a 157% increase.

## New Pallet Production

Virginia Tech first tracked new pallet production in the 1995 study. In that study it was estimated that the pallet and container industry produced 411 million new pallets for the year. The estimated 429 million new pallets produced in 1999 represents a 4% increase over the 1995 estimate.

## Pallet Recovery

From 1995 to 1999, it was estimated that the number of pallets recovered by the pallet industry increased from 171 million to 299 million (Table 4). Recovered wood material utilized by the pallet industry increased as a percentage of the total from 1995 to 1999. It was estimated that the total volume of wood (new and used) consumed by the pallet industry increased approximately 26% from 1995 to 1999, or just over 2 billion board feet. Approximately 190 million board feet of this increase was in new wood materials and 1.82 billion board feet originated from recovered wood materials. These changes represent increases of 3.4% and 50%, respectively, for new and recovered wood, suggesting that recovered wood materials are primarily satisfying any new demand for wood materials created by the pallet industry.

Multiple-use grocery pallets were consistently the most recovered pallet type. The number of multiple-use grocery pallets recovered increased from 40 million (61% of the total recovered) in 1992 to 196 million (66%) in 1999 (Table 4). Accordingly, the volume of wood recovered from multiple-use grocery pallets increased from 637 million board feet in 1992 to 2.97 billion board feet in 1999 (Table 5). The number of limited-use pallets recovered decreased as a percentage of the total over this same time period. In 1993 they represented nearly 18% of the pallets recovered and in 1999 only 12%.

## Utilization of Recovered Pallets

Of all uses for recovered pallets, the largest increases were seen in the number of pallets that were repaired and then reused or sold. Recovered pallets used for this purpose increased from approximately 41 million pallets in 1992 to 207 million in 1999 (Table 6). Over this time, the number of recovered pallets repaired

Table 6. Estimated number and proportion of recovered pallets used for various purposes: 1992, 1993, 1995, and 1999

Type of Use	Number of pallets recovered (millions)				Proportion of total number of pallets recovered (%)			
	1992	1993	1995	1999	1992	1993	1995	1999
Reused without repair	9.8	11.1	16.8	25.0	14.9	13.3	9.8	8.4
Repaired & reused	41.0	50.9	107.8	207.5	62.3	61.2	63.0	69.4
Un-nailed	9.2	12.8	30.4	48.4	14.0	15.4	17.8	16.2
Ground/chipped	5.0	6.7	13.1	15.7	7.6	8.0	7.7	5.2
Sent to landfills	N/A	N/A	1.5	1.5	N/A	N/A	.9	.5
Other	.8	1.7	1.4	1.0	1.3	2.0	.8	.3
<b>Total</b>	<b>65.8</b>	<b>83.3</b>	<b>171.1</b>	<b>299.0</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding

and reused or sold increased from 62% to 69% percent of the total. The wood volume associated with these pallets increased from 636 million board feet to just over 3 billion board feet (Table 7).

The estimated number of pallets that were un-nailed increased from 9 million in 1992 to 48 million in 1999. Much of this increase went into the production of other pallets (Table 8). Over the same

Table 7. Estimated volume of recovered pallets used for various purposes: 1992, 1993, • 1995, 1999

Type of Use	1992 (MMBF)	1993 (MMBF)	Percent Change (- / +)	1995 (MMBF)	Percent Change (- / +)	1999 (MMBF)	Percent Change (- / +)
Reused without repair	157.0	172.6	+ 9.9	255.9	+ 48.3	380.7	+ 48.8
Repaired & reused	636.3	747.3	+ 17.4	1,656.2	+ 121.6	3,098.7	+ 87.1
Un-nailed	143.6	190.0	+ 32.3	452.0	+ 137.9	713.8	+ 57.9
Ground/chipped	76.8	100.3	+30.6	194.3	+ 93.7	231.2	+ 19.0
Sent to landfills	N/A	N/A	N/A	24.0	N/A	21.7	- 9.6
Other	13.0	25.5	+ 96.2	22.8	- 10.6	14.9	- 34.6
<b>Total</b>	<b>1,026.7</b>	<b>1,235.7</b>	<b>+ 20.2</b>	<b>2,605.1</b>	<b>+110.8</b>	<b>4,461.1</b>	<b>+ 71.2</b>

Note: Column and row totals may not equal reported totals as a result of rounding.

Table 8. Estimated number and proportion of un-nailed pallets used for various purposes: 1992, 1993, 1995, and 1999

Type of Use	Number of un-nailed pallets (millions)				Proportion of total number of un-nailed pallets (%)			
	1992	1993	1995	1999	1992	1993	1995	1999
Reused to build pallets	7.6	10.3	24.7	42.3	82.4	80.1	81.2	87.4
Ground or chipped	.9	1.7	4.1	4.9	10.2	13.1	13.4	10.1
Other	.7	.9	1.6	1.2	7.4	6.8	5.4	2.5
<b>Total</b>	<b>9.2</b>	<b>12.8</b>	<b>30.4</b>	<b>48.4</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding

Table 9. Estimated volume and proportion of ground or chipped pallets used for various purposes: 1992, 1993, 1995, and 1999

Type of Use	Board feet of ground or chipped pallets (MMBF)				Proportion of pallets by type use pallets (%)			
	1992	1993	1995	1999	1992	1993	1995	1999
Landscape mulch	11.3	23.1	47.6	*164.8	12.3	18.5	18.7	54.3
Animal bedding	5.3	21.5	18.8	23.2	5.8	17.1	7.4	7.7
Fuel	48.5	52.1	110.1	69.0	53.1	41.6	43.2	22.8
Fiber products	N/A	27.5	11.3	26.9	N/A	22.0	4.4	8.9
Other	26.4	1.10	67.0	19.0	28.8	.9	26.3	6.3
<b>Total</b>	<b>91.5</b>	<b>125.3</b>	<b>254.7</b>	<b>303.0</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Column and row totals may not equal reported totals as a result of rounding.

\* Combination of uncolored and colored landscape mulch estimates

eight years, the total volume of ground or chipped wood material produced from pallets and or pallet parts increased from 92 million to 303 million board feet (Table 9). Data regarding the landfilling of recovered pallets were only collected in 1995 and 1999. It was estimated that 1.5 million recovered pallets were sent to landfills in both years. In 1995 this represented 0.9% of the total recovered pallets compared to 0.5% in 1999.

From 1995 to 1999, there was an estimated 56% increase in the number of pallets repaired or remanufactured with used pallet parts. Much of this increase appears to have come at the expense of new pallet production. The 143 million estimated pallets returned to service by the pallet and container industry in 1995 represented approximately 26% of the pallet and container industry's total pallet production. In 1999 the estimated number of pallets returned to service by the pallet and container industry had grown to 223 million and 34% of the total pallet production.

Although it is impossible to determine the number of times pallets were repaired or remanufactured and returned

to service each year, these findings clearly show that repaired pallets and pallets manufactured from used parts are capturing much of the growth in pallet production.

### Use of Ground or Chipped Pallets

The greatest change in the use of ground or chipped pallets between 1995 and 1999 was the increase in landscape mulch production. The number of recovered pallets that were ground or chipped for this purpose increased from 3.4 million to 11.2 million, respectively (Table 10). In addition, the volume used for this purpose rose from approximately 19% to 54% as a percentage of the total volume of ground or chipped pallets. In 1995, approximately 43% of the ground or chipped volume was used as fuel, whereas 23% of the volume was used for this purpose in 1999.

The shift in ground or chipped pallet material use might be related to the current value of landscape mulch. It was found in a 1998 Virginia Tech study that pallets that were recovered from landfills and subsequently ground or chipped sold for an average of \$8.50 a ton as fuel

Table 10. Estimated number of ground or chipped pallets used for various purposes: 1992, 1993, 1995, and 1999

Type of Use	1992 (million)	1993 (million)	Percent Change (- / +)	1995 (million)	Percent Change (- / +)	1999 (million)	Percent Change (- / +)
Landscape mulch	.8	1.7	112.5	3.4	100.0	*11.2	229.4
Animal bedding	.4	1.4	250.0	1.2	-14.3	1.6	33.3
Fuel	3.0	3.3	10.0	7.5	127.3	4.7	-37.3
Fiber products	N/A	1.8	-	.8	-55.6	1.8	125.0
Other	1.8	<.1	-	4.3	-	1.3	-69.8
<b>Total</b>	<b>5.9</b>	<b>8.4</b>	<b>42.4</b>	<b>17.2</b>	<b>104.2</b>	<b>20.6</b>	<b>19.8</b>

Note: Column and row totals may not equal reported totals as a result of rounding

\* Combined uncolored and colored landscape mulch estimates

as compared to \$22.30 as animal bedding, mulch, or compost (Corr 2000).

### Conclusions

Study results reveal that the pallet and container industry's demand for wood materials continues to be strong. In each of the four tracking studies conducted by Virginia Tech and the U.S. Forest Service in the 1990s, total consumption of solid wood materials (new and used) increased. When excluding hardwood plywood use, which was only estimated for 1992 and 1999, the studies reveal an increasing demand for wood panels.

The most notable change in the 1990s has been the change in composition or mixture of wood materials the industry

utilizes. In this study, softwood use was estimated to be a larger percentage of the industry's total wood use than in any of the three previous studies. From 1995 to 1999, total softwood use increased an estimated 343 million board feet while hardwood use declined 117 million board feet (Reddy et al. 1997). The increase in softwood use might be the result of the hardwood supply shortage of the mid-to-late 1990s and, to a lesser degree, CHEP's softwood pallets (Brindley 1999b).

It is difficult to predict future softwood use due to the many unknown factors involved. However, it would appear that the growth in rental pallets would increase the demand for softwoods

(Brindley 1999b). Although, manufacturers of pallets and containers might be reluctant to switch to softwood materials as long as there is a stable supply of hardwoods. Further complicating the matter is the 1996 U.S.-Canadian Softwood Lumber Agreement.

Oriented strand board has taken hold in the pallet and container industry. The 1999 estimate of 77 million square feet consumed represents a large increase over 1995's estimate (Reddy et al. 1997). At the same time, softwood plywood showed a slight decline in use. Manufacturers of oriented strand board should further examine this market for opportunities.

Most of the growth in pallet production can be attributed to the substantial increases in pallet repair and recycling. It was estimated that new pallet production increased approximately 4% between 1995 and 1999 (Reddy et al. 1997). In comparison, the number of pallets recovered and returned to service by the pallet and container industry increased 56% over the same time period. Some of the reasons given for the increase in repaired and recycled pallet

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production include: lower costs, conservation of natural resources, and a solution to current disposal problems (Bush and Araman 1998b).

Recovered wood materials are becoming a larger portion of the pallet industry's wood consumption. The amount of recovered wood used in pallet production increased from 2.28 billion board feet in 1995 to 4.1 billion in 1999, raising the proportion of recovered wood use as a percentage of the total (new and used) from 29% to 42% (Bush et al. 1997). Meanwhile, the pallet and container industry's consumption of new solid wood materials has been modest. Even with the estimated 3.6% increase from 1995 to 1999, the industry's consumption of new solid wood materials remains below the estimates for 1992 and 1993 (Christoforo 1993, Reddy et al. 1997).

The use of ground or chipped pallet material has also changed during the 1990s. The estimates for 1999 showed significant increases in the production of landscape mulch. This is likely the result of its present higher value, especially compared to fuel (Corr 2000). ■

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